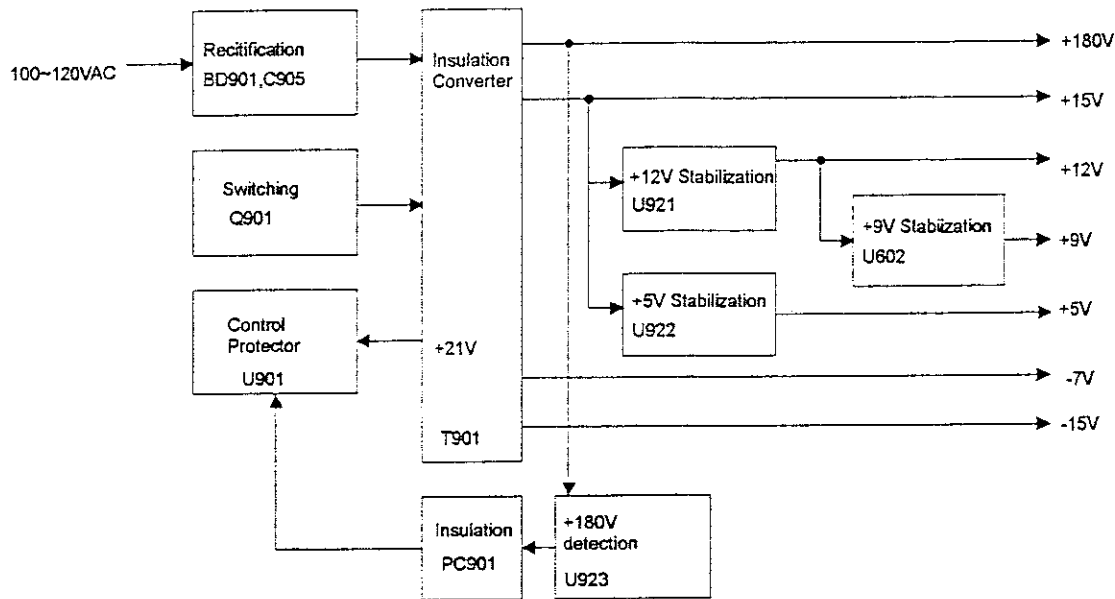


SECTION II : CIRCUIT DESCRIPTION

1. Power circuit



Power Circuit Block Diagram

This circuit generates insulated and stabilized DC voltage from AC power in order to supply the power for each circuit operation.

The following voltages are supplied to the each circuit.

- +180V: Chopper Power Circuit (Horizontal Deflection, High Voltage generating circuit, Video output circuit(In PCB-CRT)
- +/-15V: Vertical deflection IC (U401)
- +12V: Video amplifier IC (U201) , Chopper Power IC (U951) , High Voltage control IC (U701)
- +9V: Deflection IC (U601)
- +5V: Microprocessor (U351) , EEPROM (U353) , DAC (U354) , Sync. Processing IC (U101) , Video amplifier IC (U201)
- -7V: CRT heater

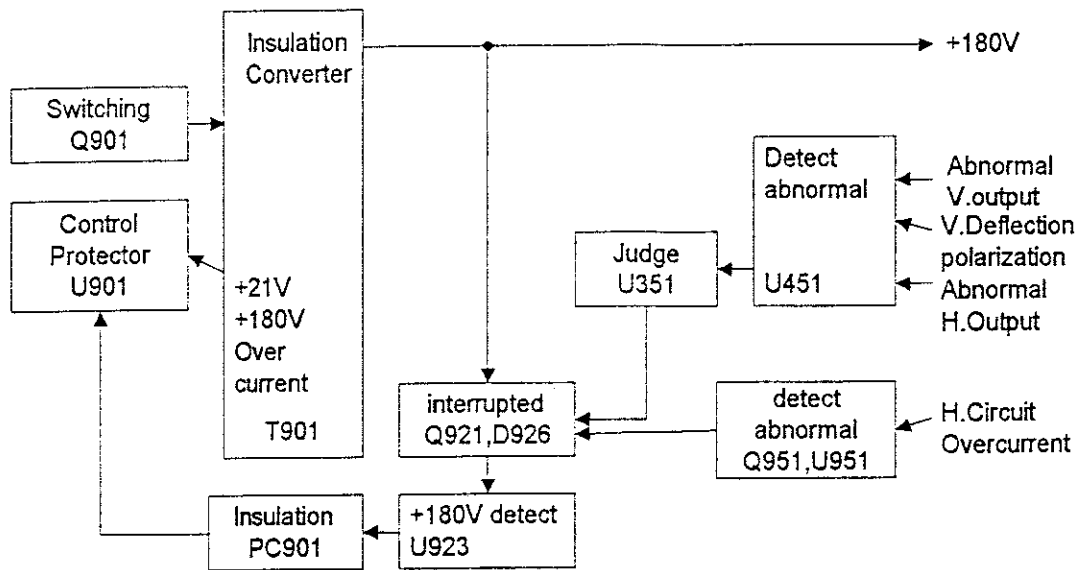
The 180V is stabilized as following order.

- The U923 compares the voltage divided from 180V output and internal standard voltage (2.5V)
- When the divided voltage is higher, the current is run to the PC901 (photocoupler) and the voltage at U901 9pin is heightened. The inverted amp output, the voltage at U901 8 pin is lowered.
- The current run into SW Q901 is detected at R907 and input to U901 4 pin.
- The U901 controls the pulse width of 1 pin by comparing the trisected voltage of U901 8 pin and

the voltage on 4 pin.

- When the 180V output is higher, the energy stored at T901 is reduced because the ON term of Q901 is shortened. Then the 180V is gone down and stabilized. The other voltages (+15V, -7V, -15V) are proportioned with 180V by the ratio of winding for T901.
- The +12V and +5V are generated from the +15V generated through the 3 terminal regulator. The +9V is generated from the +12V through the 3 terminal regulator.

2. Protection Circuit



Protection circuit Block

The protection circuit stops the circuit when the monitor is abnormal.

There are 3 detected parts.

- The Q901 over-current protector and over voltage protector by U901.
- The detection of abnormal vertical and horizontal deflection by U451
- The overcorrect detection of horizontal deflection circuit by Q951 and U951.

When the voltage on U901 7 pin exceeds the 4V, the pulse output from 1-pin stops and the power circuit operation stops. The over voltage/current is detected as follows:

- The 180V gets over voltage (about 220V) → The voltage on C910 gets higher. → The D901 conducted → The voltage on U901 7 pin gets 4V. → The pulse on U901 1 pin disappears.
- The over-current (10A peak) runs at Q901. → The R907 detects over-current. → The peak voltage on U901 2 pin gets 0.2V. → The charging current runs to C915 from U901 7 pin. → The voltage on U901 7 pin gets 4V. → The pulse on U901 1 pin disappear.

The U451 detects the following 3 extraordinariness.

- (1): The voltage on U451 5pin (to detect the extraordinary of vertical output)
- (2): The voltage on U451 3 pin and 6 pin (to detect the polarization for vertical deflection current)
- (3): The voltage on U451 2 pin (to detect the extraordinary for horizontal output)

When they are at normal, the voltages are as (1) > (2) > (3). The output of U451 1 pin and 7 pin are at high level. When the boost voltage disappears at U401 (vertical deflection IC, the voltages are (1) > (2). The output of U451 7 pin gets low level.

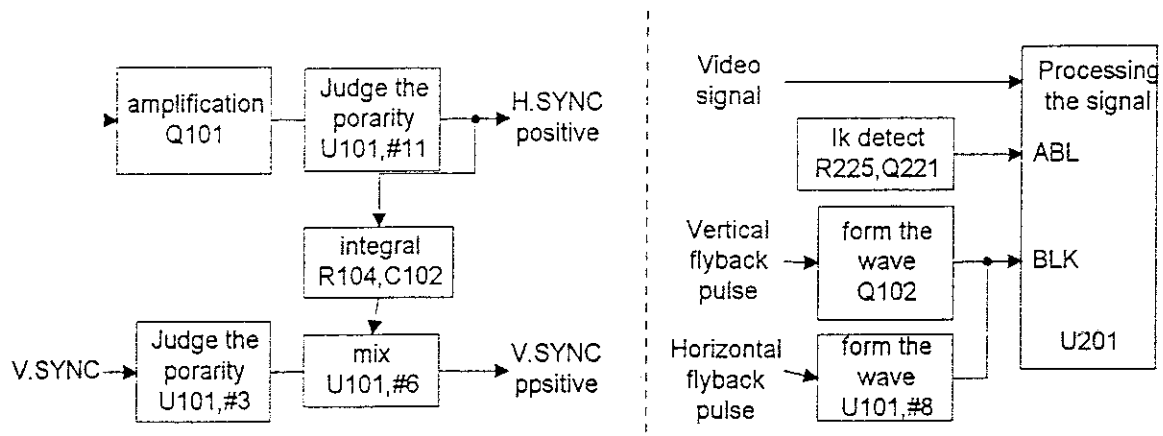
When the collector pulse of horizontal output disappears, the voltage gets (3) > (2) and the output of

U451 1pin gets low level

The output from U451 1 pin and 7 pin are input to the U351 27pin (microprocessor). The input stays at low level for 3 seconds, the HIGH is output from 26 pin of U351. Then the Q921 turns on and the 180V get over voltage with turning Q921 ON.

The Q951 detects the over-current of horizontal deflection circuit. When the over-current runs, the Q951 turns ON and charges the C957 connected to the U951 7 pin. When it reaches to 5V, the HIGH voltage output from U951 6pin. Then the Q921 turns on and the 180V get over voltage.

3. Sync Processing, ABL, and Blanking (BLK) circuit



Sync processing, ABL, BLK circuit block

The Sync.processing circuit converts the signal to positive and separate sync. signal to corresponds the composite/separate , positive/negative of the sync.signal.

The Q101 amplifies the sync of 5Vp-p.

The U101 12 pin to 11pin and 1 pin to 3 pin judges the polarity and output the positive C/H.Sync to 11 pin and positive V.Sync is output to 3 pin..

At the composite sync input, the V Sync is output from U101 6 pin divided by the integral. At the separate sync input, the V.SYNC same as the input to monitor (converted positive).

The sync signal is send to the U351 (microprocessor) and U601 (deflection IC). It is used to detect the input frequency at U351. At U601, it is used to synchronize the oscillation.

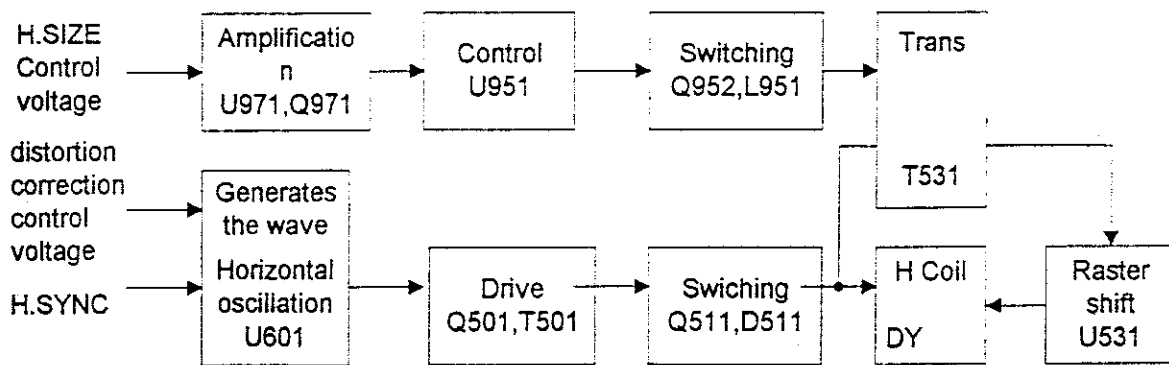
The ABL control the average current of CRT cathode to prevent the over-current to CRT. The current to the CRT runs through R225, R731, T701 8 pin and T701 HV terminal.

It detects the average current to the CRT due to the voltage descent of R225 ($I_k \div 1.3\text{mA}$) and controls the voltage on U201 27 pin.

When the voltage on U201 27 pin gets higher, the amplification degree gets smaller. As a result, the contrast gets poor and the average current of CRT cathode is controlled.

The BLK circuit prevents the flying back electron beam luminescent to reflect to phosphor. The BLK pulse is generated by the pulse generated in the fly-back term if horizontal/vertical deflection. The vertical BLK pulse formed at Q102 and horizontal BLK pulse formed at U101 9 pin to 8 pin are mixed and supplied to U201 16 pin. The video signal is blanked in the U201.

4.Horizontal Deflection Circuit



Horizontal Deflection Circuit block

These circuit runs the saw-tooth shape current (about 10Ap-p) at the horizontal coil of DY to scan the CRT electron beams right and left.

The horizontal deflection

The horizontal deflection is performed as follows:

- The U610 18pin outputs the H.Drive pulse. This pulse is synchronized with AFC by the H.Sync input to the U206 26 pin and FBP input to U601 18 pin. The H.Posotion (H.POSI) and parallelogram distortion (PARA) and the balance adjustment (BALANCE) are performed.
- It drives Q511 by converting to current at T501.
- When the Q511 turns on, the current runs to Deflection Yoke increased straightly.
- When the Q511turns OFF, the magnetic energy stored at the deflection Yoke resonant to the capacitor (C511~C514). The current inverses with cosine curve.
- The D511 conducts at the inverting the polarity. Then the resonant stops and the straightly increased current runs. By turning on the Q511 again before the current reach to zero, the current continues to increase straightly after the polarity goes back. Thus, the saw-tooth wave runs to the deflection Yoke.

The drive current of Q511 requires adjusting. When the Q511 is replaced the VR501 requires adjustment in order the voltage of CN951 get minimum level at the condition of $f_H=31\text{kHz}$ 、 $H.SIZE=MIN$.

The Q502 adjusts the drive current according to the H.Size. More current runs to Q502 when the H.Size is enlarged. The RY512 turns On at $f_H=24\text{kHz}$ and $f_H=15\text{kHz}$. The RY513 turns On at $f_H=15\text{kHz}$. Thus the linearity variation is corrected. The U531 adjusts the raster position. When ITC is adjusted due to the CRT or DY replacement, the raster position is changed. Then the R.Shift must be readjust in order the raster comes to the center of the CRT at the condition of $f_H=31\text{kHz}$ and raster appears (by the BRIGHT or SCREEN).

The horizontal size adjustment and raster distortion adjustment.

The H.Size adjustment and raster distortion adjustment is by controlling the horizontal deflection

circuit voltage.

The horizontal size adjustment is performed as follows:

- The U351 (microprocessor) sends to H.SIZE data to U354 (DAC).
- The H.Size voltage runs through U354 5pin, U971 5pin, 7pin and Q971. At the Q971, the current runs proportioned to the voltage on U354 5 pin. The voltage on U971 1pin and U951 12 pin are higher proportioned to the Q971 current.
- The U951 controls the horizontal deflection circuit voltage (the voltage on C953) in order to be proportioned to the voltage on U951 12 pin. This means that the low term of U951 1 pin pulse gets short when the voltage on 11 pin gets high (C953 voltage). Then the ON term of Q952 gets short and the output keeps fixed level with going down the voltage on C953.

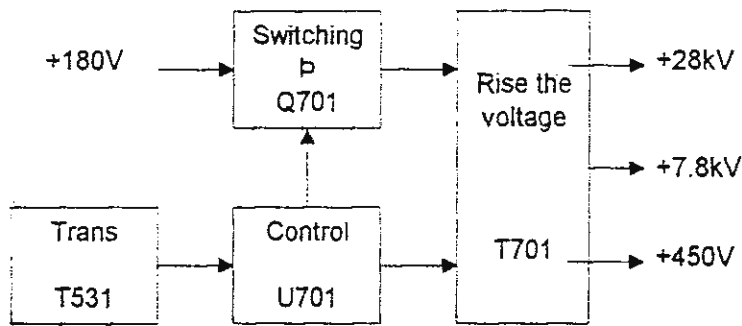
The voltage of horizontal deflection circuit is different according to the horizontal frequency and horizontal size. It is about 45 V at $fH=15kHz$, about 70V at $fH=24kHz$ and about 90V at $fH=31kHz$.

The raster distortion correction is performed as follows:

- The data for distortion correction sends to U354 (DAC) from the U351 (microprocessor).
- The U354 send to the control voltage for the CORNER, TRAPE and SPC distortion correction to U601.

The U601 10 pin outputs the each correction mixed wave. The U971 2 pin superimposes to horizontal size adjustment voltage.

5.High Voltage Circuit block



High voltage circuit block

This circuit supplies the high voltage to the each electrode for the operation of the CRT. This circuit supplies 28 kV to the CRT anode, 7.8 kV to focus electrode and about 450V to the G2 electrode. When the pulse (about 10Vp-p) is input to the U701 4pin from the horizontal deflection circuit, the triggered pulse is output from U701 1pin and the high voltage circuit operates.

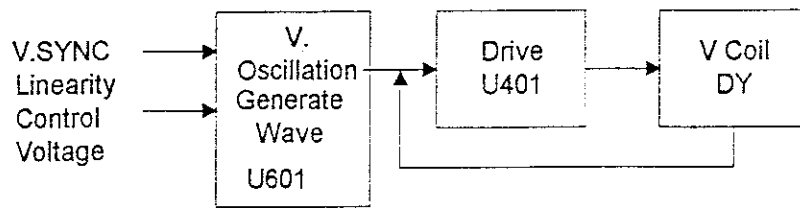
The high voltage is stabilized as follows:

- The voltage parted from high voltage is inputs to U701 6 pin from T701 11pin.
- The drive pulse is output from the U701 1pin. When the input voltage to 6 pin (high voltage) gets high level, the ON term gets short.
- Then, the energy stored at T701 is decreased and the high voltage is gone down. Thus, the high voltage keeps its level.

The X-ray protection is performed as follows:

- This circuit gets the voltage proportioned to the high voltage from the tertiary winding voltage of T701 (FBT).
- The protector operates when the voltage on U701 10 pin becomes 2.35V.
- The voltage on C711 is 24.05 V when the high voltage is 31.5kV. In order to the protector operation of such case, the VR711 has been adjusted and locked with silicone.

6. Vertical Deflection Circuit



Vertical Deflection Circuit Block

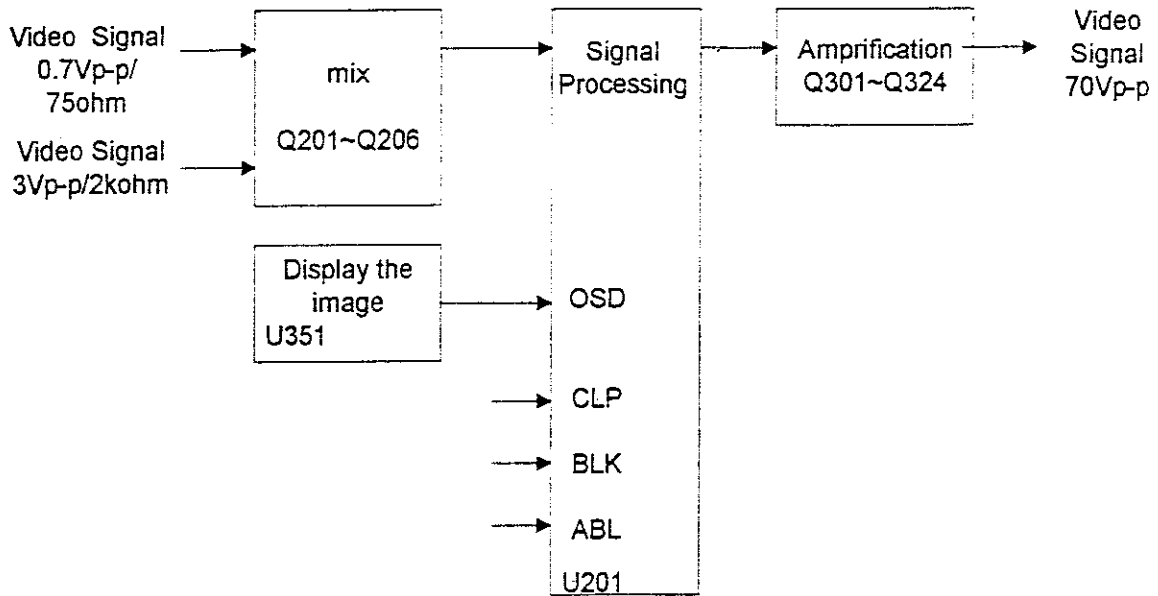
This circuit runs the saw-tooth shape current (about 1.8Ap-p) to the V.Coil of the DY in order to scan the electron beam vertically.

The saw-tooth voltage (about 2Vp-p) is output from U601 9 pin, which is triggered by the V.SYNC pulse.

The linearity correction signal (V.L.S and V.L.C) transmits to the U601 (deflection IC) through the U351 (microprocessor) and U354 (DAC). It is output from U601 9pin superimposed to the saw-tooth voltage.

The U401 operates as the ope-amp. (The +input is U401 5 pin, the – input is U401 6 pin). This means that the output from U401 3 pin varies so that the wave output from U601 9 pin and the wave converted by the R408 from the current run at DY.

7.Video Amplified Circuit



Video Amplified Block

This circuit amplifies 0.7Vp-p/3Vp-p-input signal to about 70Vp-p to gain the sufficient contrast. The input signal 0.7Vp-p/75 Ω or 3Vp-p/2k Ω are united to 0.65 Vp-p amplitude at the mix circuit(Q201~Q206) and supplied to U201.

The U201 treat the amplification, direct-current restoration, switching the OSD signal, Brightness adjustment, contrast adjustment, ABL adjustment and blanking addition. The signal transmitted to PCB-CRT (about 1.6 Vp-p) amplified to about 70Vp-p at Q301~Q324 and supplied to CRT cathode.